# Mitigating the Impact of Admixtures in Thai Herbal Products

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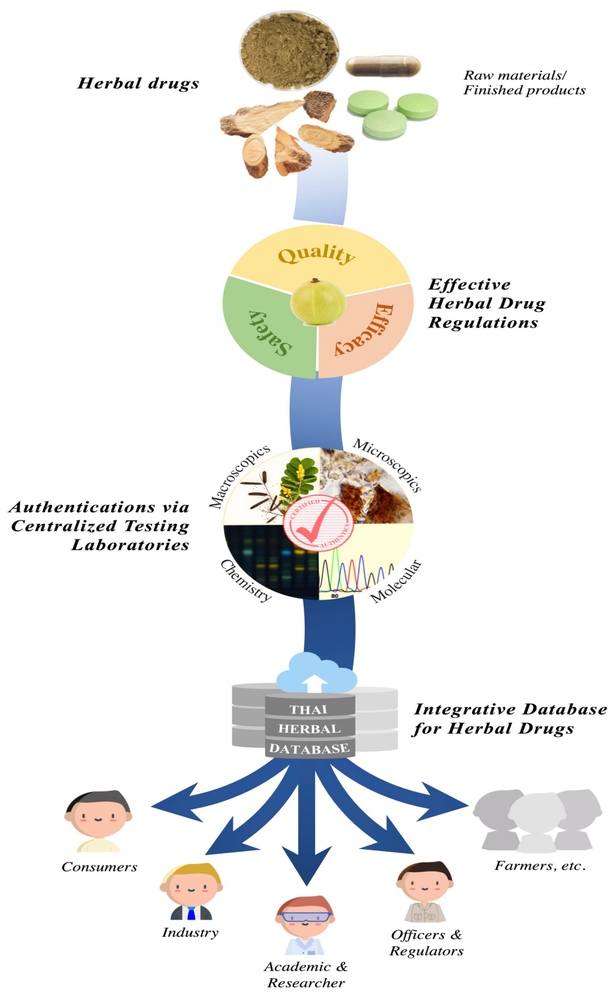


**Figure 1** Proposed regulatory framework of traded herbal drugs in Thailand.

## Background

- Medicinal plants and their products are extensively used within indigenous healthcare systems in Thailand and several other nations. The international trade of herbal products has a noteworthy impact on the worldwide economy, and the interest in herbal products is expanding in both developing and developed countries[1].
- There has been rapid growth in the medicinal plant product market. However, in herbal industries, substitution and admixture are typical issues wherein species of lower market value are admixed with those of a higher value[2].
- The adverse consequences of consuming adulterated drugs are invariably due to the presence of an unintended herb rather than the presence of an intended herb[2]. It has also been argued that admixtures are intentional because of the lack of regulatory policies for product authentication[3].

**Aim:** This study aims to clarify the extent of species admixtures reported in the Thai herbal market and discuss the potential reasons for such adulteration.

## Methodology

- The literature search was performed with various electronic databases [Google Scholar, Science Direct (Scopus), and Web of Science,] using specific search terms such as “Thai Herbal Pharmacopoeia (THP) mentioned plant names”, “Thai medicinal plants”, “Admixtures of Thai medicinal plants”, and “Thai herbal medicine”, which included peer-reviewed scientific studies and reports used to document traditional medicinal plants used in THP.

## Results and Discussions

**Table 1** Information on the sixty-six documented medicinal plants used in the Thailand Herbal Pharmacopoeia 2018.

| Thai name | Scientific name | Family | Habit | Parts used | Treatment/application |
|---|---|---|---|---|---|
| Wannam (ว่านน้ำ) | *Acorus calamus* L. | Acoraceae | Aquatic perennial herb | Dried rhizome | Carminative |
| Matum (มะตูม) | *Aegle marmelos* (L.) Corrêa | Rutaceae | Tree | Fruits and bark | Antidiarrheal, stomachic |
| Hom (หอม) | *Allium ascalonicum* L. | Amaryllidaceae | Biennial herb | Dried bulb | Carminative, expectorant |
| Krathiam (กระเทียม) | *Allium sativum* L. | Amaryllidaceae | Herb | Bulb | Antimicrobial, antihyperlipidemic |
| Fa Thalai (ฟ้าทะลายโจร) | *Andrographis paniculata* (Burm. f.) Nees | Acanthaceae | Herb | Dried aerial part | Antidiarrheal, antipyretic, antiinflammatory |
| Thian Ta Takkatan (เทียนตาตั๊กแตน) | *Anethum graveolens* L. | Apiaceae | Annual herb | Dried ripe fruit | Carminative, pharmaceutic aid |
| Kot (โกฐสอ) | *Angelica dahurica* (Hoffm.) Benth. & H | Apiaceae | Perennial herb | Dried root | Antipyretic, analgesic |

**Table 2** Species admixtures in the herbal trade samples of medicinal plants listed in the Thai Herbal Pharmacopoeia and discriminant technique employed.

| Thai name | Scientific name | Matrix type | Total number samples | % of species admixture detected | Declared/identified species | Discriminant technique employed | Reference |
|---|---|---|---|---|---|---|---|
| Maksong (หมากสง) | *Areca catechu* L. | Processed sample | 45 | 38.09 | Nil | Mini-DNA barcode | Ming et al., 2017 |
| Matum (มะตูม) | *Aegle marmelos* (L.) Corrêa | Leaf, root, fruit | 203 | 0 | Nil | DNA barcode | Santhosh et al., 2018 |
| Fa Thalai (ฟ้าทะลาย) | *Andrographis paniculata* (Burm.f.) Nees | Dried sample, powder, capsule, tea | 10 | NQ | *Andrographis paniculata, Acanthus ebracteatus* and *Rhinacanthus nasutus* | DNA barcode | Osathanunkul et al., 2016 |
| Thian Ta Takkatan (เทียนตาตั๊กแตน) | *Anethum graveolens* L. | N/A | N/A | NQ | *Trachyspermum ammi* and *Foeniculum vulgare* | DNA barcode | Schori and Showalter 2011 |
| Kot (โกฐสอ) | *Angelica dahurica* (Hoffm.) Benth. & Hook.f. ex Franch. & Sav. | Root | N/A | NQ | Nil | Metabarcoding and real-time PCR | Xin et al., 2018 |

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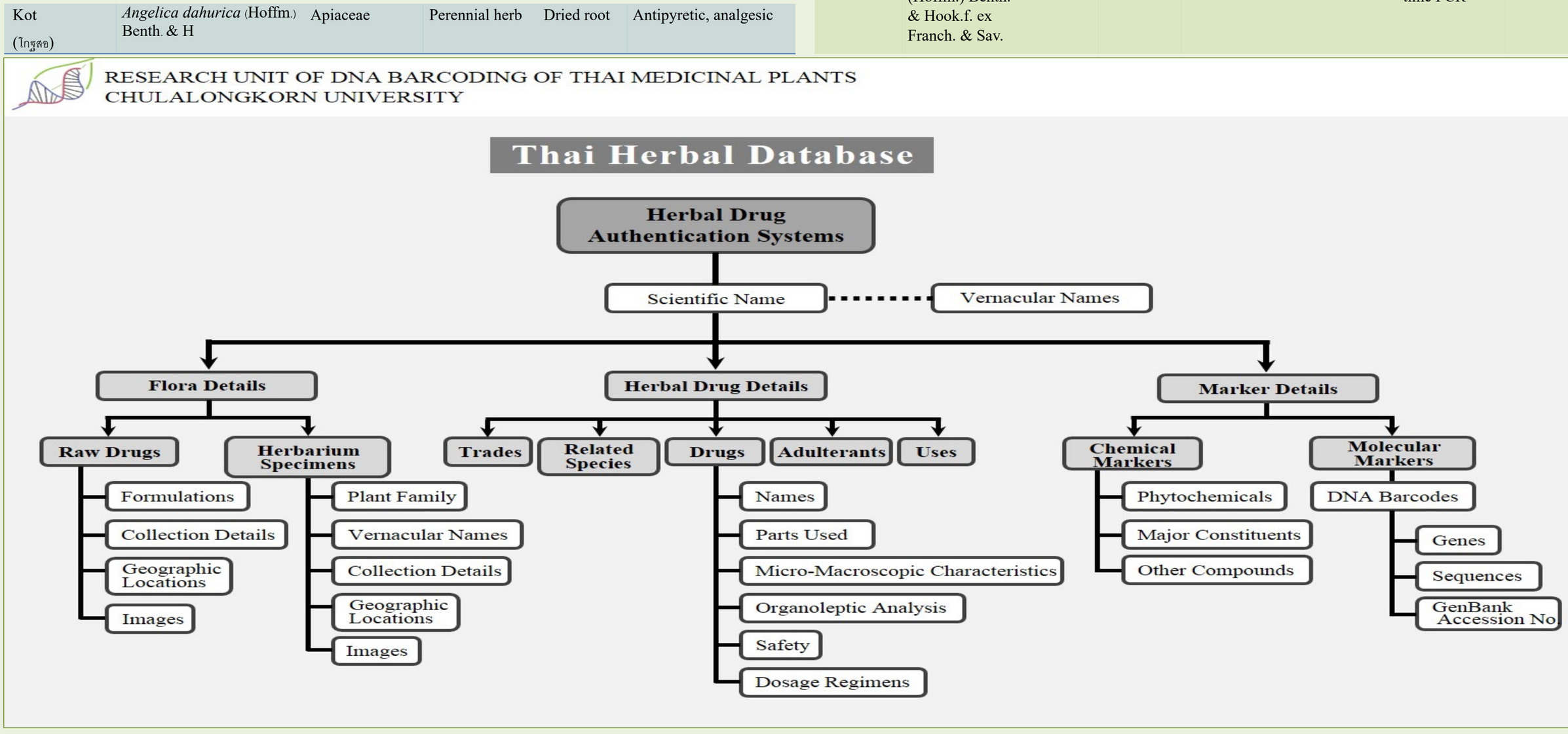


**Figure 2** Schematic representation of the Thai Herbal database.

## Conclusion

- ❖ This herbal database concept could be a novel strategy in Thailand, generating transparency for all safety and quality measures and facilitating the prevention of admixtures in the herbal trade.
- ❖ This herbal database should be developed with utmost planning and made available to all researchers, academicians, people involved with regulatory policy and industry, and, most importantly, common people so that they may gain access to past and present studies.
- ❖ The use of this concept can allow governing bodies to improve the efficacy of herbal drugs at a considerable cost.

## References

[1]Lo, Y. T. & Shaw, P. C. Application of next-generation sequencing for the identification of herbal products. *Biotechnol Adv* 37, 107450 (2019).

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